Find the unknown side lengths in each special right triangle.

1. A 30°-60°-90° triangle with hypotenuse 2 ft.

2. A 45°-45°-90° triangle with leg length 4 in.

3. A 30°-60°-90° triangle with longer leg length 3m

- I can develop and apply the formulas for the area and circumference of a circle.
- I can develop and apply the formula for the area of a regular polygon.

Vocabulary		
circle	center of a circle	center of a regular polygon
apothem	central angle of a regular polygon	

Common Core: CC.9-12.G.GMD.1 Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone.

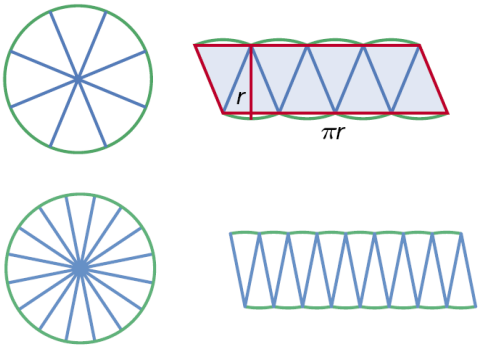
4. What is a circle?

5. What is π?

6. What is the formula for the circumference of a circle?

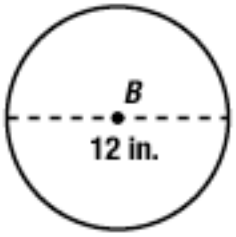
You can use the circumference of a circle to find its area. Divide the circle and rearrange the pieces to make a shape that resembles a parallelogram.

7. What is the formula for the area of a circle?



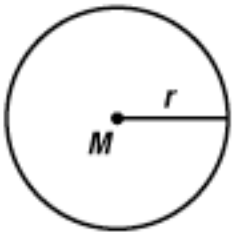
Video Example 1.

A) Find the area of $\bigcirc B$ in terms of π .

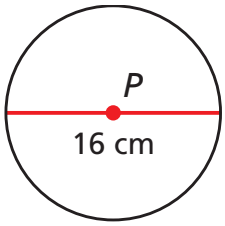


B) Find the radius of $\bigcirc Y$ in which $C = 32\pi$ cm.

C) Find the circumference of $\bigcirc M$ if the area is $A = 4x^2\pi\ m^2$.



1 Finding Measurements of Circles



Find each measurement.

A **the area of $\odot P$ in terms of π**

$A = \pi r^2$ *Area of a circle*

$A = \pi(8)^2$ *Divide the diameter by 2 to find the radius, 8.*

$A = 64\pi \text{ cm}^2$ *Simplify.*

Find each measurement.

B **the radius of $\odot X$ in which $C = 24\pi$ in.**

$C = 2\pi r$ *Circumference of a circle*

$24\pi = 2\pi r$ *Substitute 24π for C.*

$r = 12\ in.$ *Divide both sides by 2π.*

C **the circumference of $\odot S$ in which $A = 9x^2\ \pi \text{ cm}^2$**

Step 1 Use the given area to solve for r.

$A = \pi r^2$ *Area of a circle*

$9x^2\pi = \pi r^2$ *Substitute $9x^2\pi$ for A.*

$9x^2 = r^2$ *Divide both sides by π.*

$3x = r$ *Take the square root of both sides.*

Step 2 Use the value of r to find the circumference.

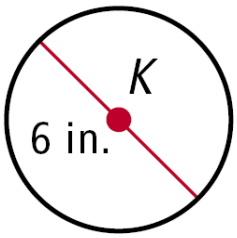
$C = 2\pi r$

$C = 2\pi(3x)$ *Substitute 3x for r.*

$C = 6x\pi \text{ cm}$ *Simplify.*

Example 1.

A. Find the area of $\odot K$ in terms of π.



B. Find the area of $\odot J$ if the circumference is $(65x+14)\pi\ m$.

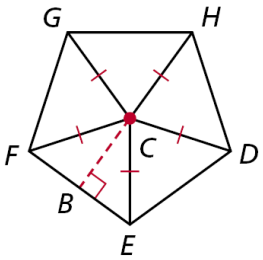
C. Find the circumference of $\bigcirc M$ if the area is $25x^2\pi\ ft^2$

8. <u>Guided Practice</u>: Find the area of $\bigcirc A$ in terms of π in which $C = (4x - 6)\pi\ m$.

Helpful Hint

The π key gives the best possible approximation for π on your calculator. Always wait until the last step to round.

9. What is a regular polygon?



10. What is the center of the regular polygon?

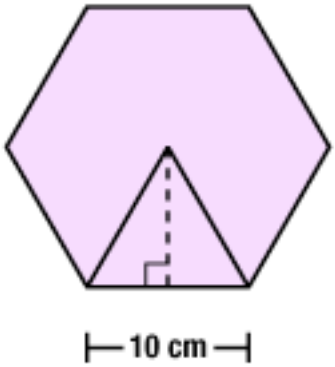
11. Compare and contrast the apothem and radius of a regular polygon.

12. How do you find the central angle of a regular polygon?

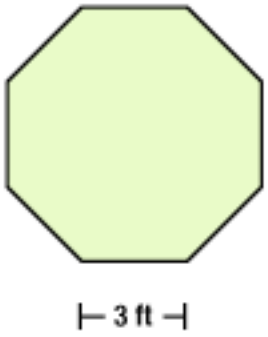
13. How do you find the area of a regular polygon?

Video Example 3

A) Find the area of polygon.



B) Find the area of polygon.

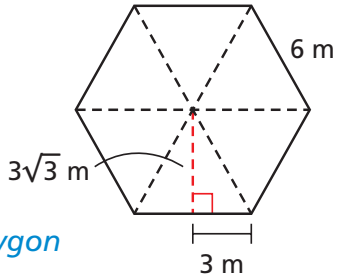


3 Finding the Area of a Regular Polygon

Find the area of each regular polygon. Round to the nearest tenth.

A **a regular hexagon with side length 6 m**

The perimeter is $6(6) = 36$ m. The hexagon can be divided into 6 equilateral triangles with side length 6 m. By the 30°-60°-90° Triangle Theorem, the apothem is $3\sqrt{3}$ m.



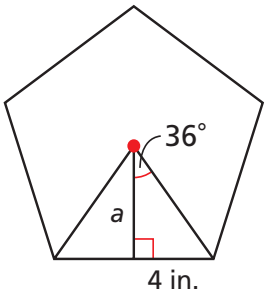
$A = \frac{1}{2}aP$ *Area of a regular polygon*

$A = \frac{1}{2}(3\sqrt{3})(36)$ *Substitute $3\sqrt{3}$ for a and 36 for P.*

$A = 54\sqrt{3} \cong 93.5 \text{ m}^2$ *Simplify.*

B **a regular pentagon with side length 8 in.**

Step 1 Draw the pentagon. Draw an isosceles triangle with its vertex at the center of the pentagon. The central angle is $\frac{360°}{5} = 72°$. Draw a segment that bisects the central angle and the side of the polygon to form a right triangle.



Step 2 Use the tangent ratio to find the apothem.

$\tan 36° = \frac{4}{a}$ *The tangent of an angle is $\frac{\text{opp. leg}}{\text{adj. leg}}$.*

$a = \frac{4}{\tan 36°}$ *Solve for a.*

Step 3 Use the apothem and the given side length to find the area.

$A = \frac{1}{2}aP$ *Area of a regular polygon*

$A = \frac{1}{2}\left(\frac{4}{\tan 36°}\right)(40)$ *The perimeter is $8(5) = 40$ in.*

$A \cong 110.1 \text{ in}^2$ *Simplify. Round to the nearest tenth.*

Remember!

The tangent of an angle in a right triangle is the ratio of the opposite leg length to the adjacent leg length. See page 525.

Example 3.

A. Find the area of regular heptagon with side length 2 ft to the nearest tenth.

B. Find the area of a regular dodecagon with side length 5 cm to the nearest tenth.

14. <u>Guided Practice</u>: Find the area of a regular octagon with a side length of 4 cm.

10-2 Developing Formulas for Circles and Regular Polygons *(p 691)* 11-13, 15, 17, 22, 26, 30, 31, 33, 35, 38, 39, 41-44.

Q: What do you get when you divide a jack-o'-lantern's circumference by its diameter?
A: Pumpkin pi.

"The next best thing to solving a problem is finding some humor in it."—*Anonymous*